

Cross-linguistic influence in bilingual production of clear speech

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RESEARCH BACKGROUND

- Clear speech production involves both language-universal and language-specific strategies.
 - Language-specific strategies are potentially subject to cross-linguistic influence.
- An example of language-specific clear speech strategies: enhancing laryngeal contrasts in stops.
 - In English: the distinction between voiceless and voiced stops is enhanced via an asymmetrical VOT lengthening of voiceless stops (e.g., Picheny et al., 1986)
 - In Korean: a distinctive acoustic cue is enhanced depending on a specific binary contrast (Kang & Guion, 2006).
 - Aspirated-lenis contrast: onset F0
 - Aspirated-fortis and lenis-fortis contrasts: onset F0 and VOT
- Relatively little is known to date about bilingual clear speech across languages (cf. Granlund et al., 2012).

RESEARCH QUESTIONS

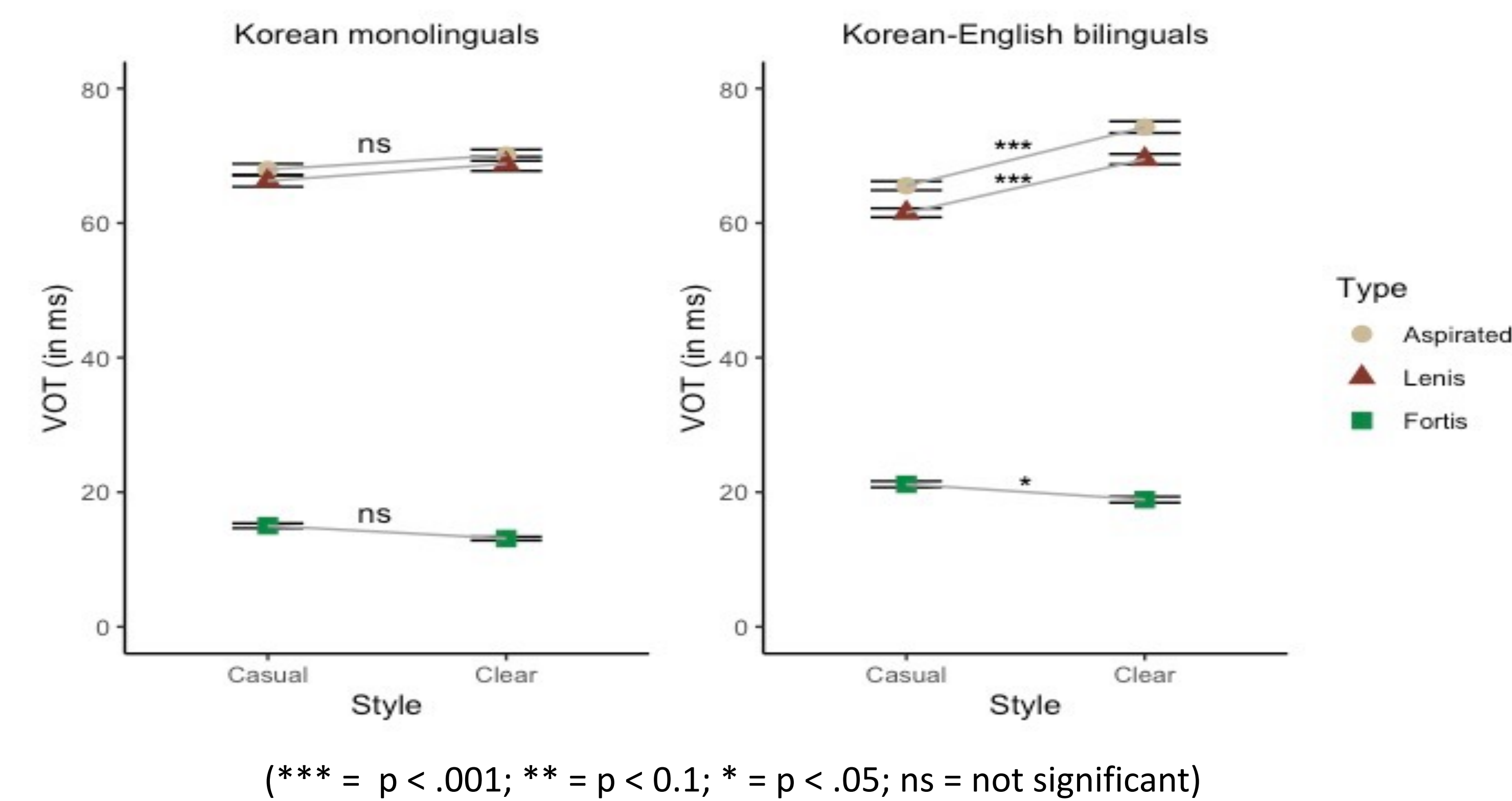
- To what extent do Korean-English bilinguals maintain language-specific clear speech strategies in each of the two languages they speak?
- To what extent is their clear speech subject to cross-linguistic influence? For example, would their English clear speech be realized in a Korean-like manner and vice versa?

METHODS

- Participants
 - 30 Korean-English bilinguals residing in the US (20M, age mean = 29.73, age SD = 3.48)
 - 20 Midwestern American English monolinguals (4M, age mean = 24.95, age SD = 9.30)
 - 20 Korean monolinguals residing in South Korea (8M, age mean = 27.40, age SD = 5.52)
- Stimuli
 - 6 English minimal pairs differing in voicing of word-initial alveolar stops: e.g., *tab* vs. *dab*
 - 6 Korean minimal/near-minimal triplets that differ in laryngeal states of word-initial stops: e.g., *t^han.t^han.ha.ta* (탄탄하다; aspirated) vs. *tan.tan.ha.ta* (단단하다; lenis) vs. *t*an.t*an.ha.ta* (뚝뚝하다; fortis)
- Procedure
 - Participants read each target word one by one in isolation.
 - Casual speaking style preceded clear speaking style.
 - Each target word appeared three times within each speaking style.
- Measurements
 - VOT of word-initial stops (in ms)
 - Onset f0 (normalized in semitones; Dmitrieva et al., 2015)
- Analyses
 - A linear mixed effect model (*lme4* package) was implemented in R, along with ANOVA tests (*car* package) and pairwise post-hoc tests (*emmeans* package).
 - Fixed effects for English data: Speaker Group (K-E bilinguals vs. English monolinguals), Stop Type (voiced vs. voiceless), Speaking Style (casual vs. clear)
 - Fixed effects for Korean data: Speaker Group (K-E bilinguals vs. Korean monolinguals), Stop Type (aspirated vs. lenis vs. fortis), Speaking Style (casual vs. clear)

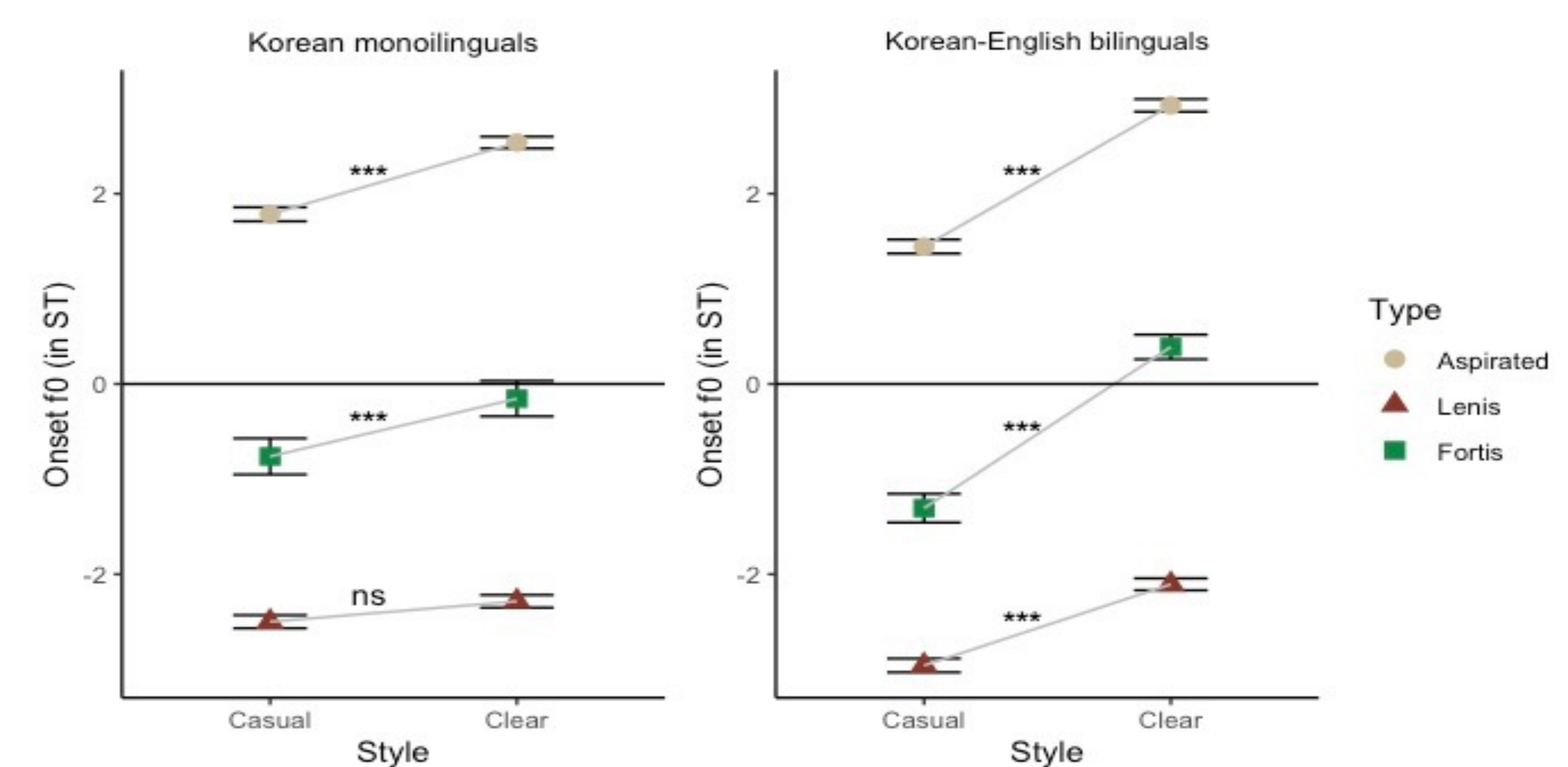
RESULTS

1.1 Korean clear speech: VOT



- Significant effects of Stop Type (aspirated = lenis > fortis; $\chi^2(2) = 239.74$, $p < .001$) and Speaking Style (clear > casual; $\chi^2(1) = 15.12$, $p < .001$).
- The following interactions were significant:
 - Speaking Style * Stop Type ($\chi^2(2) = 106.75$, $p < .001$): The VOT distinction became greater in Korean clear speech in a type-specific manner.
 - Increased VOT of aspirated and lenis stops.
 - Decreased VOT of fortis stops.
 - Speaking Style * Stop Type * Speaker Group ($\chi^2(2) = 19.98$, $p < .001$): The VOT enhancement between stop types was more pronounced in Korean clear speech produced by K-E bilinguals.

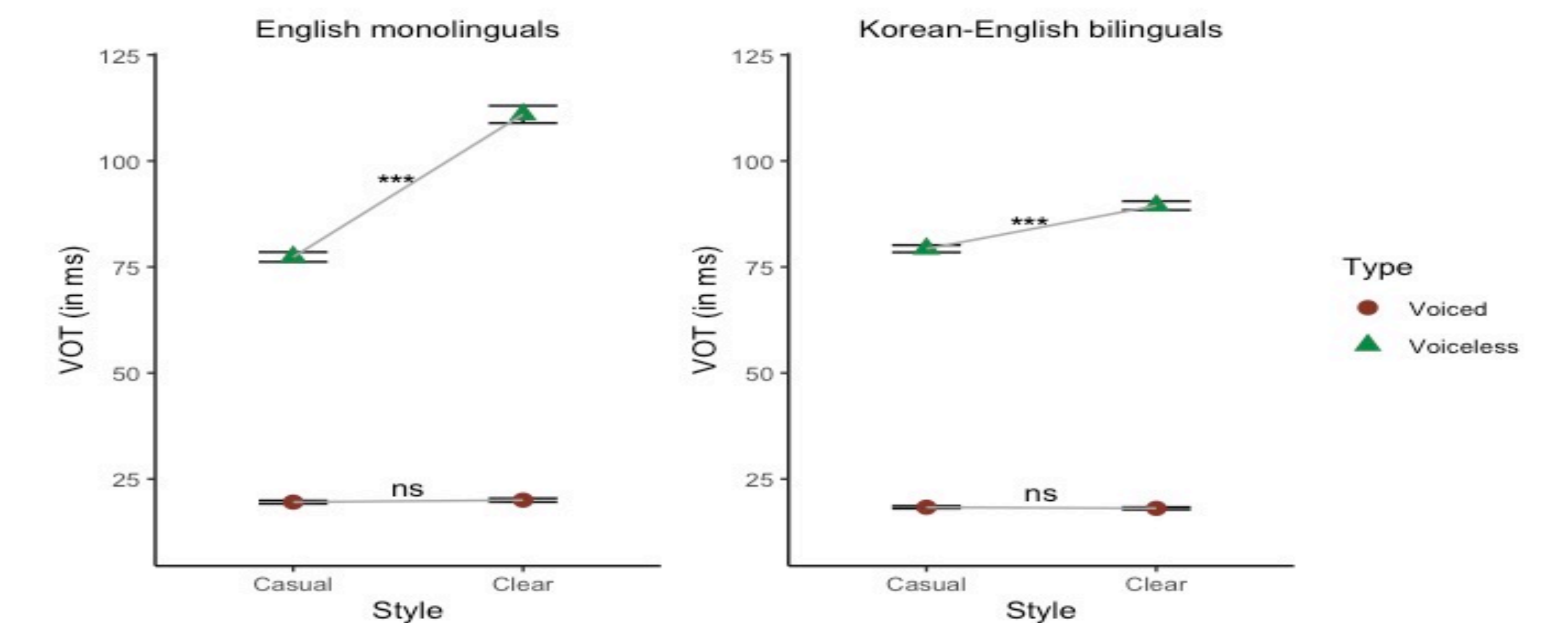
1.2. Korean clear speech: Onset f0



- Significant effects of Stop Type (aspirated > fortis > lenis; $\chi^2(2) = 2139.26$, $p < .001$) and Speaking Style (clear > casual; $\chi^2(1) = 214.56$, $p < .001$).
- A Speaking Style by Stop Type interaction was significant ($\chi^2(2) = 19.77$) = 9.87, $p < .001$).
 - Onset f0 of every stop type was increased in Korean clear speech.
 - However, the degree of the increase was greater for aspirated and fortis stops than for lenis stops.
 - As a result, the onset f0 difference between lenis and the other two stop types was expanded in Korean clear speech.

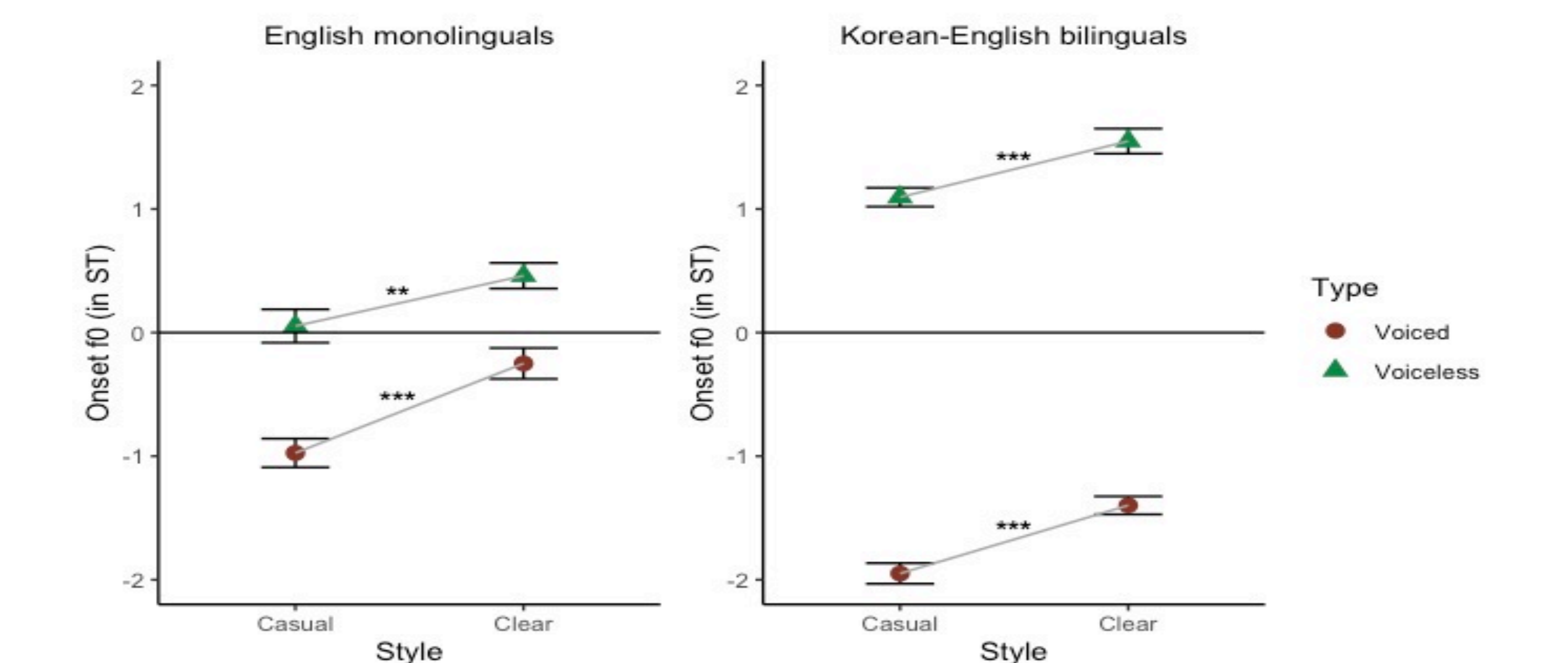
RESULTS (CONT'D)

2.1 English clear speech: VOT



- Significant effects of Stop Type (voiceless > voiced; $\chi^2(1) = 6040.74$, $p < .001$) and Speaking Style (clear > casual; $\chi^2(1) = 51.43$, $p < .001$).
- Speaker Group * Stop Type ($\chi^2(1) = 51.43$, $p < .001$), Speaking Style * Stop Type ($\chi^2(1) = 51.43$, $p < .001$), and Speaking Style * Stop Type * Speaker Group ($\chi^2(1) = 51.43$, $p < .001$) interactions were all significant:
 - English monolinguals made a greater VOT distinction between stop types than K-E bilinguals.
 - The VOT difference was enhanced in English clear speech, and this pattern was more pronounced in English monolinguals' clear speech.

2.2 English clear speech: Onset f0



- Significant effects of Stop Type (voiceless > voiced; $\chi^2(1) = 254.01$, $p < .001$) and Speaking Style (clear > casual; $\chi^2(1) = 56.53$, $p < .001$).
- A Speaker Group by Stop Type interaction was significant ($\chi^2(1) = 224.44$, $p < .001$):
 - K-E bilinguals made a greater onset f0 distinction between stop types than English monolinguals.
- No other interactions were significant.

DISCUSSION & CONCLUSION

- Across the two languages, VOT and onset f0 differences between stop types were often enhanced in a type-specific manner.
 - e.g., Only VOT of "long-lag" stops was lengthened in clear speech.
 - Overall, bilingual clear speech demonstrated both language-specific characteristics and evidence of cross-linguistic influence.
 - Used onset f0 to enhance the contrast in Korean but not in English.
 - Used VOT enhancement more than Korean monolinguals but less than English monolinguals.
- VOT plays a more prominent role in demarcating stop types in English than in Korean.

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